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ABSTRACT

Industry Initiatives for Science and Mathematics Education (IISME) is a program that provides summer fellowships to K-12 science, mathematics, and technology teachers in industry, government, and university research labs. The study reported in this document addresses the concern that IISME encourages teacher retention and surveys teachers who were participants of IISME since 1985. Contents include: (1) "Overview of the Study"; (2) "Attrition Rates among IISME Fellows"; (3) "Characteristics of Fellows Still in Education"; (4) "Future Career Plans"; (5) "Professional Impact"; (6) "Benefits of Multiple Fellowships"; and (7) "Conclusions and Recommendations". Appendices contain the IISME Teacher Retention and Long-Term Impact Questionnaire and data collection methodology. (YDS)

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Industry Initiatives for Science and Mathematics Education

IISME Teacher Retention and Program Impact 1985-2000

By
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October 2001

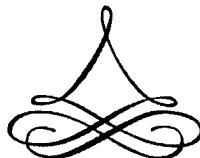
IISME gratefully acknowledges the support of
the Intel Foundation and the SBC Foundation for underwriting this study.

My IISME experiences go back to the summers of 1986 and 1987. In the fall of 1985 I took an unpaid leave from my full-time science teaching position--primarily due to burnout. I was completing my seventh year of teaching. I traveled extensively for six months, and then I developed new science curriculum for our school. When I returned, I was flat broke and in debt and not at all convinced that a traditional high school classroom was the best place for me.

Fortunately, I hooked up with IISME the following summers and landed fantastic positions in the seismology lab (1986) and the atmospheric sciences department (1987) of the Lawrence Livermore National Laboratory. It was a tremendous experience. I worked with "real" top-notch scientists doing cutting-edge research, I was given meaningful work to contribute, I was treated very well by both LLNL and IISME, I was made to feel valued as a professional, I learned tons, AND I was able to pay off all my debts within a year.

I still recommend IISME to my teaching colleagues, I'm sure it contributed significantly to keeping me in the teaching profession. I'm now quite happy teaching five sections of Earth Science--the course that emerged from my 1985-87 experiences.

**Tom Tyler
Bishop O'Dowd High School**



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IISME Teacher Retention and Program Impact 1985-2000

Summary of Findings

Does experience in industry entice teachers to leave teaching? This is the question often posed to the Board of Directors and staff of Industry Initiatives for Science and Mathematics Education (IISME). From its inception in 1985 through the summer of 2000, IISME has provided 1,320 Summer Fellowships in industry and government and university research labs to 761 pre-college science, mathematics, and technology teachers. Do teachers use these unique summer experiences to leave their often troubled, low-paying careers in education for the higher-paying, more "glamorous" jobs in industry? From the perspective of potential sponsors, this is a critical question. Sponsors do not want to contribute to a program that ostensibly supports education, only to find that the program secretly sabotages the field by recruiting its subject matter specialists. School administrators also occasionally express concern that IISME helps teachers leave the profession.

With funding from the Intel and SBC Foundations, a study was designed to address the issues of IISME teacher retention in the field of education and of long-term program impact. In the fall of 2000, surveys were sent to 734 teachers who have participated in the IISME Summer Fellowship Program since 1985, and 425 surveys were returned, for a return rate of 58%. Highlights from the analyses can be summarized as follows.

- There is quantifiable evidence that teachers who have participated in the IISME Summer Fellowship Program stay in teaching at higher rates than their peers in the state and nation. IISME Fellows have left the *field of education* at an average rate of 2% per year since 1985. If we count teachers who have since become school and district administrators, curriculum and technology specialists, counselors and the like as "leavers," the estimated annual attrition rate of IISME Fellows from *classroom teaching* positions is 4%. These compare favorably with annual state and national rates of attrition from classroom teaching of approximately 8%. All percentages include retirees.
- The years 1998-2000 did show greater rates of teacher attrition than earlier years, no doubt due to the economic "boom" experienced by the region in mathematics, science, and technology-related career opportunities. There is no evidence, however, that an IISME Summer Fellowship experience encourages or helps teachers to leave the field; in fact many teachers report that a Summer Fellowship served as a catalyst for them to stay in teaching.
- The reasons teachers give for leaving the field of education, and for considering a career change, are low salary, poor administrative support, and no opportunity for professional advancement. Their reasons are very consistent with the reasons given by a larger national sample of science teachers.

- While this study presents a very positive picture of IISME's role in teacher retention, it must be noted that 32% of all respondents still in education indicated they are thinking about leaving teaching in the next five years. This is slightly less than the 38% of science teachers in a national study that responded positively to the same question.
- Respondents were very positive about the quality of the IISME program, 33% rating it "the best" and an additional 50% among the "top 10%" of professional development experiences available to them.
- The IISME experience has a strong impact on teachers' professional self-concept, on their knowledge of their subject area and of technology, and on their ability to counsel their students in pursuing careers in math, science, and technology.
- IISME Fellows access community resources and add examples and illustrations from industry to improve the interest and relevance of their instruction.
- Nearly three-fourths of all respondents (72%) felt the IISME experience increased their commitment to teaching.
- Multiple years of participation appear to enhance the experience and multiply the outcomes obtained. "Veteran Fellows" report more frequent and varied classroom transfer activities and greater impact on professional self-concept than one-time participants.
- There are some subject area differences throughout the survey. Science teachers tend to report they benefited from program participation in areas of professional development and professional advancement more consistently than mathematics teachers. They also report higher rates of incorporating new content into classroom instruction and connecting students to industry personnel. One interpretation of these differences is that science teachers are more likely to have job placements that are more directly relevant to their subject area expertise.
- Program improvements made in 1998 seem to have yielded very positive results. Among those whose last year in the program was prior to 1998, only 27% reported implementing an Education Transfer Plan, the "blueprint" that is central to a teacher's intention to transfer the summer experience back to the classroom. However, 65% of those who have participated since 1998 reported implementing their own or one from a colleague.
- IISME Fellows go on to hold a variety of leadership and professional support positions. Nearly half (43%) become department chairs or administrators. One third have been in positions focused on teacher professional development or curriculum development and nearly 20% have served as computer or technology specialists at their schools.

The study results are described in detail in the full report, which concludes with issues and recommendations regarding the use of the results for program improvement.

IISME Teacher Retention and Program Impact 1985-2000

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IISME Teacher Retention and Program Impact 1985-2000

I. Overview of Study

A. Purpose of Study

Does experience in industry entice teachers to leave teaching? This is the question often posed to the Board of Directors and staff of the Industry Initiatives for Science and Mathematics Education (IISME) program. From its inception in 1985 through the summer of 2000, IISME has provided 1,320 Summer Fellowships in industry and government and university research labs to 761 high school science, mathematics, and technology teachers¹, with some teachers participating in the program for several years. In internal evaluations, teachers have praised the benefits of program participation, such as increased professional self-esteem and better understanding of how mathematics, science, and technology are used in industry applications. They have gained experience in high-technology cutting-edge industries, seen first-hand the perks of working in these companies, and established contacts among mentors and summer colleagues. Do teachers then use these experiences and contacts to leave the often troubled, low-paying careers in education for the higher-paying, more "glamorous" jobs in industry?

From the perspective of potential sponsors, this is a critical question. Sponsors do not want to contribute to a program that ostensibly supports education, only to find that the program secretly sabotages the field by recruiting its subject matter specialists. School and district administrators also do not want to support a program that dissuades teachers from staying in the classroom. IISME has always addressed the question with anecdotal evidence, citing examples of individual teachers who have used the program's resources and contacts to enrich their classroom instruction and to advance on the educational career ladder. But thanks to funding from the Intel and SBC Foundations, IISME had the opportunity to explore the question more systematically.

B. Study Design and Methods

In this study, surveys were sent to 734² teachers who have participated in the IISME Summer Fellowship Program since 1985. The survey contained questions regarding teachers' current employment (i.e., in education or not), future career plans, and ratings of the potential benefits of IISME participation.

The surveys were mailed in September, 2000. (The survey is included in Appendix I.) Through various follow-up procedures (described in Appendix II), 425 surveys were eventually returned, a return rate of 58%.

¹ In recent years, the program has expanded to include teachers from other grade levels and subject areas, but the majority of participants have been high school science and mathematics teachers.

² Some of the 761 Fellows have been removed from IISME's mailing lists, at their own request or due to special circumstances.

The most important outcome for this study is an estimate of the percentage of IISME teachers who have remained in the field of education after their participation in the summer program. It was reasonable to assume that those who did not respond to the survey mailing might have left the field of education in larger numbers than those who did return the survey promptly. To check this assumption, and to obtain the best possible estimate of the percentage of attrition for the full population of IISME Fellows, a second wave of data collection was focused on 100 randomly selected individuals from the "non-response" pool. IISME staff went to extraordinary efforts to track down these individuals and obtain information on whether they are still in education. The attrition rate obtained for these 100 Fellows was compared to that of the other respondents, and a weighted average was calculated to estimate the attrition rate for the total population. For program ratings and other descriptive items, all survey responses were considered as one total group.

II. Attrition Rates Among IISME Fellows

A. Fellows Still in Education

The most critical and important question posed in the survey was the first: "Are you still employed in the field of education?" The primary purpose of the study was to estimate the percentage of the total IISME population that has remained in education after their IISME experience. Among the 326 Fellows who initially responded to the survey, 288 (88.3%) are still in the field of education. We realized that this subset of IISME Fellows might have higher rates of retention than the remaining subset of Fellows who did not respond immediately. To obtain a more accurate estimate of the percentage for the full population, we randomly selected 100 Fellows from the remaining pool of 408. For these "late respondents," the percentage still in education was 79.8% (79 out of 99), which is lower than the initial estimate obtained from the first group.

The weighted average of these two percentages, and the best estimate of the percentage of the full population of IISME Fellows still in education, is 83.4%³ (with a standard error of 2.2%). This corresponds to an estimated annual attrition rate of 2.3%.

The survey question posed by IISME asked about retention in the field of education. IISME staff have known that many IISME Fellows have advanced to administrative positions or other types of jobs within their schools and districts. For example, nearly 20% of the respondents have held positions as computer or technical specialists. A third (31.6%) have been department chairpersons. Comparable numbers have been staff developers or curriculum specialists. These are leadership positions that provide

³ Note that this value, determined by averaging the values for the early and late respondents, is the estimated retention rate for the *whole population* of IISME Fellows. It is slightly different from the retention rate obtained for the sample of 425 Fellows who completed the survey, which was 86.4%.

opportunities for IISME Fellows to share their knowledge and expertise with a wide audience of teachers, administrators, and other school and district personnel. From IISME's perspective, having program participants in those types of positions is an asset.

From the perspective of comparing attrition rates to other groups of teachers, however, a different estimate must be used. The state and national attrition figures we were able to obtain for comparison purposes are all based on the number of teachers who remain in the classroom, teaching. These figures are usually calculated to determine the number of teachers who will need to be hired in future years; thus, a teacher moving to an administrative position creates a need for an additional teacher and is therefore considered "attrition from the classroom."

In our sample, 78.8% of the initial respondents, and 68.7% of the late respondents are still in the classroom. Our weighted estimate of the percentage of the total IISME population still in teaching is 73.5% (with a standard error of 2.4%). **This corresponds to an estimated annual attrition rate of 4%.**

The estimated annual attrition rate for the state of California is 6%, with an additional 2% per year in retirement, for an estimated total of 8% attrition per year (Shields et al, 1999; Fetler, 1997; Cohen and Das, 1996) and 8-9% for the nation as a whole (Ingersoll, 1999).

While these initial estimates of attrition rates indicate that IISME Fellows are staying in the profession (whether measured by "still in education" or "still teaching") at higher rates than their colleagues, the comparisons are not perfect. State data are projections based on averages across years, regions, and subject areas. Separate attrition rates are not available for science and mathematics teachers. Also, it is not clear whether or not these estimates take into account teachers who move from one district to another. National data are based on the *Teacher Follow-up Survey* from the School and Staffing Surveys (SASS) (NCES, 1996). These analyses identify "movers" and the data are broken down by subject area, but the latest data were collected on attrition rates from 1993-94 to 1994-95. Recent economic trends in the nation, and in particular in Silicon Valley where IISME operates, might suggest that attrition rates would be higher for mathematics and science teachers in the last two to three years, given the wealth of opportunities for higher paying jobs in high-technology fields. Within the limitations of our database, we decided to explore some patterns of attrition that might be related to these factors.⁴

⁴ When we began the study, we were not sure we would be able to obtain appropriate state or national attrition figures to use as comparisons for the IISME population. So we included a sample of applicants, teachers who had applied to the program but had not been accepted. We sent surveys to 200 applicants, but only 74 responded, and no special efforts were made (as in the case of the Fellows' sample) to contact non-respondents. There is no motivation for applicants to stay in touch with the program (by making sure IISME has a current address, for example) unless they are interested in applying to the program again. Of the 74 who responded, most were recent applicants (1998-2000) and over a quarter were novice teachers (less than five years teaching experience). Given these demographics, we did not feel the comparisons would be accurate or useful.

B. Patterns of Attrition

National and state reports estimate that 30% of the teaching force leaves teaching within the first three years of entering the profession (Darling-Hammond, 2000) and nearly 50% leave in the first 5-7 years (Fetler, 1997). As shown in Table 1, 38% of the IISME Fellows who had only been teaching for two to three years⁵ left the field of education. While this figure is alarming, it is well within that projected for the teaching force at large; IISME Fellows in this stage of their teaching careers are not leaving at greater rates than their colleagues with the same years of experience. Within the Fellow population, the attrition rate does stabilize in the next category, "four to five years of teaching." In the next category, "6-10 years of teaching," there is another spike in the percentage of attrition, perhaps as teachers leave the profession (temporarily or permanently) to start families or pursue other personal goals. Attrition rates are low and stable until the final category, "30+ years of teaching" when, as we might expect, large numbers of teachers begin retiring from the profession.⁶ These patterns indicate that the Fellows who participate at the peak of their teaching careers do tend to stay in the profession.

Table 1. Attrition Rate by Number of Years in Education

Number of Years in Education	Number of Respondents in Cohort	Number of Cohort who Left Education	Percent of Cohort who Left Education
2 to 3	16	6	37.5%
4 to 5	36	3	8.3%
6 to 10	70	12	17.1%
11 to 15	77	7	9.1%
16 to 20	35	1	2.9%
21 to 25	39	3	7.7%
26 to 30	51	4	7.8%
30+	48	8	16.7%
Missing data	53	14	26.4%
<i>Total</i>	425	58	13.6%

⁵ IISME requires applicants to have taught for at least two years, in order to have some foundation for transferring their industry experience back into classroom practice.

⁶ We are missing data on the number of years in education for 14 of the Fellows we know have left education. Percentages reported here are based on the proportion of the respondents in each category who provided the information.

A more alarming trend was detected upon analyzing the number of teachers who left the field of education in any given year. While there are some missing data⁷, particularly for the earliest years of the program, there is a clear pattern of small but steady attrition (one to three teachers from the existing group each year) until 1998-2000. These last three years alone account for more than half of the total attrition; 22 of the 45 "leavers" reported they left teaching in 2000. These 22 were distributed across cohorts, with some teachers from cohorts as early as 1986 and 1988. Half (11 of the 22), however, were from the 1999 and 2000 summer cohorts. IISME staff interviewed six of the 1999 Fellows who left teaching to discuss their reasons for leaving the field. Some had been considering the move for quite a while and found the time to be right. Nearly all assured the staff that they thought highly of the program and that the experience had not been an impetus to leave teaching (but for a couple, at least, had kept them in the field a year or so longer). We suspect that the high-technology "dot-com boom" in 1999, perhaps coupled with highly publicized problems in the state educational system, convinced many teachers that this was the time to leave the profession and try new ventures. Given the recent slow-down in the economy, it is difficult to predict whether or not this pattern will continue.

There is some disagreement among reports regarding different rates of attrition across subject areas. The common assumption is that mathematics and science teachers leave teaching at higher rates than teachers in other subject areas, because of the increased opportunities for higher paying jobs in their specialties outside of education. Some researchers report, however, that this trend is not significant (e.g., Ingersoll, 1999). Subject area statistics from the national SASS do show differences in attrition rates across subject areas, but these variations are not consistent from year to year.

On the whole, the SASS data for science teachers tend to show slightly higher attrition rates than mathematics teachers. For science teachers, the average annual attrition over three time periods (1988-89, 1991-92, 1994-95) was 6.0%; for mathematics teachers over the same time period the average was 5.67%. In the IISME data, 22.5% of the science teachers (29 out of 129) and 15% (15 out of 101) of the mathematics teachers left education at some point in their careers. These rates are slightly higher than those of IISME teachers in "other" subjects (12% of whom have left education). These figures correspond roughly to 3.5% annual attrition for science teachers and 2% annual attrition for mathematics—the same pattern as in the SASS data but at much lower rates.

C. Career Choices and Reasons for Leaving the Field

What are the Fellows who left teaching currently doing? Of the 58 Fellows who have left teaching,

- 18 (31%) have taken jobs in industry,
- 13 (22%) have retired,

⁷Of the 58 Fellows who have left education, 45 (77%) indicated the year they left the field.

- 7 (12%) are unemployed,
- 6 (10%) are students,
- 6 (10%) are self-employed,
- 4 (7%) have taken jobs in education, medicine, or religion,
- 4 (7%) did not report their new professions.

The reasons Fellows gave for leaving the field of education varied, but tended to cluster around three major reasons: *dissatisfaction with job, retirement, and to pursue different careers*. *Family or personal reasons* ranked fourth, and only three reported leaving because of *school staffing actions*.

Those who cited *job dissatisfaction* (N=22) were asked to select among several specific reasons and then to rank-order these reasons. *Low salary* was the most often chosen; 16 of the 22 respondents cited this reason for job dissatisfaction, and 13 of these gave it their highest ranking. This is a complaint heard from teachers around the country, but it is perhaps even more compelling in a geographic area with such a high cost of living. *No opportunity for personal advancement* was listed next with nine (41%) choosing this as a reason; six of the nine teachers ranked this as the top reason for them. Similar numbers of respondents chose *poor administrative support* as a reason for job dissatisfaction. Potential reasons relating to students (*student discipline* and *poor student motivation*) ranked very low among these IISME Fellows, as did items relating to *class size, lack of professional development opportunities, and lack of faculty influence*.

III. Characteristics of Fellows Still in Education

IISME Fellows who have remained in the field of education have held a variety of teaching, leadership, and professional support positions. Since the IISME program is exclusively directed to classroom teachers, it is no surprise that 93% of the Fellows still in education are or have been classroom teachers in the past five years. Nearly half (43%) have also held leadership positions in their school or district, as department chairpersons or administrators. One-third (35%) have been in positions focused on professional development or curriculum development and nearly 20% have served as computer or technical specialists at their schools or districts.

The distribution of the sample across number of years teaching is presented in Table 2. This distribution is compared to that of a national sample of science teachers obtained by the National Science Teachers Association (NSTA) in a study conducted in 2000.⁸ IISME requires its applicants to have taught for at least two years, in order to have some classroom experience as a foundation for transferring the industry experiences

⁸ NSTA sampled 5,000 middle level and high school science teachers; 1,370 responded to the survey.

back into classroom practice. As a result, the distribution of teachers in the one to three year range is noticeably below that of the NSTA sample. However, the distribution of the remaining experience groups is nearly identical to the NSTA sample. IISME Fellows appear to be similar to the greater teaching force in science in terms of years of experience in teaching and represent the full range of experience levels.

Table 2. Distribution of Fellows by Number of Years Teaching

Number of Years in Education	Percent of IISME Fellows	Percent of NSTA Sample
1-3	3%	13%
4-6	12%	10%
7-9	8%	9%
10-15	24%	20%
16-20	9%	8%
20+	33%	39%

IISME has traditionally recruited high school science, mathematics, and technology teachers but in recent years the program has expanded its recruitment to K-8 and community college faculty and teachers in other subject areas. Tables 3 and 4 illustrate the distribution of IISME Fellows still in education by grade level and subject area.

Table 3. Distribution of Fellows by Subject Area

Subject Area*	Frequency	Percent (N=367)
Natural Science	117	32%
Mathematics	103	28%
Technology	62	17%
English	27	7%
Social Science	12	3%
Arts	4	1%
Foreign Language	4	1%
Elementary	28	8%
No Response	65	17%

*More than one category could be selected.

Table 4. Distribution of Fellows by Grade Level

Grade Level	Number	Percent (N=367)
Elementary School	28	7.6%
Middle School (6-8)	49	13.4%
High School (9-12)	208	56.7%
College/Adult Education	19	5.2%
Multi-grade	12	3.3%
Missing Data	51	13.9%

IV. Future Career Plans

A. Plans to Leave the Field of Education

For those who have remained in the field of education, other survey questions focused on their future career plans. Questions in this part of the survey matched the questions included in the NSTA survey and therefore the IISME results can be compared to those from the larger national sample of science teachers.

Of the 367 Fellows still in education, 117 (32%) say they anticipate leaving the field within the next five years (see Table 5). This is slightly less than the 38% of the NSTA sample who responded positively to the same question in their survey.

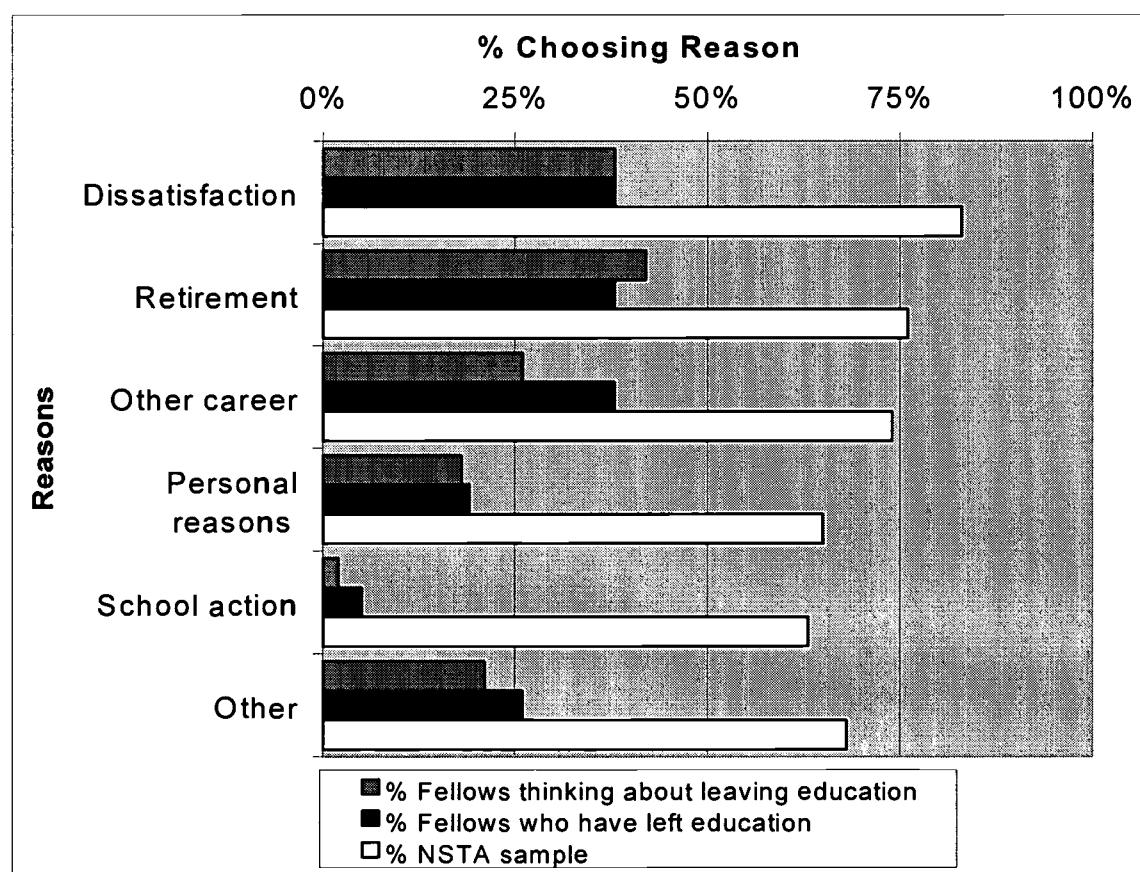
Table 5. Percentage of Teachers Considering Leaving the Field of Education

Considering Leaving Profession?	IISME Fellows (n=367)	NSTA Sample (n=1,365)
Yes	32%	38%
No	58%	59%
No response	10%	3%

The reasons these Fellows give for possibly leaving the field are displayed in Figure 1. The three groups represented in the figure are: 1) IISME Fellows who indicated they are thinking about leaving the field of education within the next five years; 2) IISME Fellows who have left education; 3) the teachers in the NSTA national sample.

The response patterns for Fellows who have already left and for those who are thinking about leaving are very similar. This suggests that IISME Fellows are fairly consistent in their reasons for leaving the field of education, and these reasons are consistent with those expressed by other colleagues around the nation. The relative ranking of the categories is similar across the IISME and NSTA samples.⁹ The two most common reasons for considering leaving the field of education are *dissatisfaction with job* and *retirement*. A larger percentage of Fellows who have left education indicate that they left to *pursue another career*, but relatively few IISME Fellows cite *family or personal reasons* or *school staffing action* as likely reasons for leaving the field. In the "other" category, teachers elaborated on the need to find a higher paying job in the Bay Area, but they also listed reasons such as "starting a family," "politics controlling education," "need for a change", and "variety, try new things."

Figure 1. Reasons Teachers are Considering Leaving Education



⁹ The comparison with the NSTA sample, while desirable, is less than satisfactory, because of the large percentages of NSTA respondents choosing each and every alternative.

The consistency in results from the IISME and NSTA samples is further supported in the rankings of the more specific reasons these teachers gave for their job dissatisfaction. As we described earlier in this report, *low salary* was ranked first by IISME Fellows who have left as well as those who are thinking about leaving. *Poor administrative support* and *no opportunity for personal advancement* ranked second and third in the IISME samples. For the NSTA sample, *poor administrative support* seemed to be the most pressing dissatisfaction, but *low salary* was a close second.

Responses to these items were fairly consistent and predictable across categories of teaching experience. Among IISME Fellows who are thinking about leaving education, *low salary* and *poor administrative support* ranked slightly higher among newer teachers (compared to more experienced teachers), whereas *no opportunity for professional advancement* ranked higher among more experienced teachers than among the novice teachers.

B. IISME's Role in Plans or Decisions to Leave Education

Among IISME sponsors and some school administrators, concerns are sometimes raised regarding IISME's role in providing teachers with experience, contacts, and motivation to help them leave the field of education. This, despite anecdotes from teachers who report that the IISME experience reaffirmed their commitment to teaching. The survey included explicit questions regarding IISME's role in the Fellows' decisions to leave the field of education or to stay in the field of education longer.

Table 6. IISME as Impetus for Staying in Education

<i>Did IISME serve as impetus to stay in teaching?</i>			
Categories of Respondents		Number Responding "Yes"	Percent Responding "Yes"
Current Career	Still in Education	329	76.6%
	Left Education	43	67.4%
Years Teaching	0-5	52	69.2%
	6-10	70	75.7%
	11-15	75	73.3%
	16-25	71	77.5%
	26+	94	78.7%
Years as Fellow	One Time	207	70.5%
	Multiple Times	164	81.7%

Responses to the question "Did IISME serve as an impetus to stay in teaching?" are displayed in Table 6 for different subgroups of respondents. Of the total sample, 75% (281 of the 372 who answered the question) said that IISME had encouraged them to stay in teaching, at least for a longer time. Among the "stayers," 77% said IISME had served as an impetus to stay. Even among the "leavers," two-thirds (67%) reported that the IISME experience had motivated them to stay in teaching for a while longer.

Across categories of teaching experience, slightly fewer teachers in the 0-5 years teaching range answered positively (69%) compared to teachers in the other categories (in which percentages ranged from 73% to 79%). Multiple years in the program appear to reinforce IISME's positive influence, with 82% of Fellows who have participated multiple years responding "yes" compared to 70% of Fellows who participated only once. There are no notable differences in response patterns across categories of subject taught, teaching level, or year of program participation.

Those Fellows who said IISME encouraged them to stay in teaching (N= 281) were asked to check off specific ways in which the program exerted this encouragement. Frequencies of teachers choosing each potential program benefit are presented in Table 7.

Table 7. How IISME Encourages Fellows to Stay in Teaching

How did IISME encourage you to stay in teaching?*	Frequency	Percent Selecting Item (n=281)
Offered professional challenge	227	80.8%
Gave new perspectives on role as teacher	179	63.7%
Increased enthusiasm for teaching	166	59.1%
Added income so I could stay in teaching	158	56.2%
Gave me a breather to refresh for the fall	135	48.0%
Affirmed commitment to teaching	128	45.6%
Offered professional support network	101	35.9%
Increased awareness of benefits of teaching	76	27.0%

*More than one category could be selected.

Most Fellows (81%) said that IISME encouraged them to stay in teaching by offering a *professional challenge* via the summer experience. Teachers also indicated that the IISME experience offered *new perspectives on their roles as teachers* (64%), an *increased enthusiasm for teaching* (60%), as well as *additional income* to supplement their salaries (56%).

For most of these items, there were some notable differences across patterns of response for certain subgroups of respondents. Novice teachers (0-5 years teaching) chose *new perspectives on role as teacher* more often than did more experienced teachers, whereas veteran teachers were more interested in the *professional challenge* offered by IISME than their less-experienced colleagues. Fellows who participated in the program for multiple years tended to select the following items more frequently than those who participated only once: *increased enthusiasm for teaching*, *added income*, *offered professional support network*, and *professional challenges*. Some of the 1998 program changes, or perhaps just the recency of the experience, prompted teachers from later years to select five of the eight items more frequently than teachers whose last year of participation was prior to 1998.

Among those respondents who have left education (n=58) and those who anticipate leaving education within the next five years (n=117), only 43 (25%) said that IISME contributed to their decision to leave teaching. The top three reasons listed were: 1) *made me feel more respected* (18%); 2) *showed me better pay/work conditions* (17%); 3) *gave me a view of another work environment* (16%). The remaining alternatives were chosen much less frequently: *gained confidence to make career change* (10%); *new skills made me more employable* (8%); and *confirmed desire to work with adults* (7%).

V. Professional Impact

In addition to data on the rate of and reasons for teacher attrition, the survey was designed to collect data on the program's impact on teacher professional goals, perspectives, and activities. The ultimate purpose of the Summer Fellowship program is to provide teachers with experiences, knowledge, insights, and resources that they can draw upon in their schools and classrooms—both for their own professional growth and for the enhancement of their students' learning experiences. Questions included ratings of overall program quality and of specific areas of impact on professional goals, classroom practice, and leadership activities.¹⁰

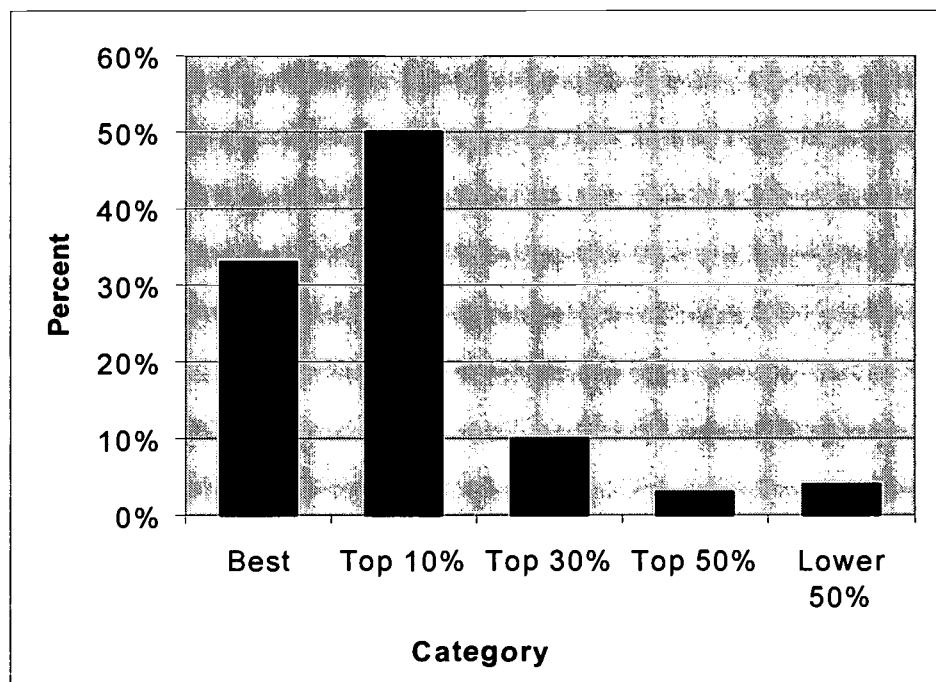
¹⁰ The sample size for the items in this section is 332; 93 respondents did not complete any items in this section. IISME staff were able to determine whether some Fellows are still in education, without getting a completed survey from the Fellow. Others simply skipped this section.

A. Assessment of IISME's Quality as a Professional Development Program

Respondents were asked to compare their IISME Summer Fellowship experience to all other professional development programs in which they had participated. The overwhelming majority of respondents (83%) rated the program as either the best (33%) or in the top 10% (50%) of professional development programs. Another 11% rated it in the "next 20%." In total, 94% of the respondents placed IISME in the top 30% of all professional development experiences. Responses were fairly consistent across all categories of experience ("number of years teaching"). However, those teachers who have participated multiple times rated IISME as "the best" more consistently—44% compared to 23% of the one-timers.

Interestingly, similar percentages of respondents in and out of the field of education assigned the "best" or "top 10%" ratings to the program (87% of those still in education and 83% of those who have left education). Those whose last program participation was in the summers of 1998 and beyond tended to rate the program among the "best" (36% compared to 29% for pre-1998 Fellows), reflecting, perhaps, a positive evaluation of programmatic changes instituted in 1998.

Figure 2. Teacher Ratings of Quality of IISME Program



B. Areas of Professional Impact

Fellows were asked to indicate the extent to which they felt the program offered specific professional benefits. For each item, respondents were asked whether the benefit was a short-term effect, a long-term effect, or "both." They could also say it was not an effect at all. In Table 8, these responses are tabulated, with the frequency of teachers who selected "some effect" (i.e., short term, long term, or both) for a given area of potential impact. Teachers were also asked to rate the strength of the effect as "strong," "moderate," or "weak."

Three items drew the strongest responses from the teachers. Approximately 80% of the teachers indicated that the program had some impact on *improved professional self-concept*, *increased knowledge of careers*, and *additional opportunities for professional development*. Experienced teachers tended to rate *improved professional self-concept* as having a "strong effect" more frequently than novice teachers did, but all groups were fairly consistent on their ratings of the *increased knowledge of careers* item. These are the areas that teachers agree are IISME's strongest, most consistent, and pervasive influences. The immersion in industry exposes teachers to first hand information about how math, science, and technology are used in careers, and the education and experience necessary to attain these careers. But the experience working side by side with industry colleagues and experts has an equally powerful effect on teachers' views of themselves as professionals.

Table 8. IISME Program Effects

Area of Program Effect*	Frequency Indicating "Some Effect"®	Percent Indicating "Some Effect"® (N=332)
Improved professional self-concept	276	83.1%
Increased knowledge of careers	275	82.8%
Offered professional development	266	80.1%
Increased commitment to teaching	238	71.7%
Provided access to community resources	233	70.2%
Offered new class content	229	69.0%
Offered new teaching strategies	170	51.2%
Facilitated professional advancement	163	49.1%

*More than one category could be selected.

®Respondents could select "weak," "moderate," or "strong" effect.

Nearly three-fourths of the Fellows (72%) felt the experience *increased their commitment to teaching*. Interestingly, there is no difference in levels of this effect reported by those who are still in education versus those who have left the field.

Other items were rated as areas of program impacts, but not as strongly or consistently. IISME is not seen by most as a way of *facilitating professional advancement* in the school career ladder. Typically, advancement is based on set criteria such as degree attained, number of years of teaching experience, and, perhaps, amount of professional development, but specific professional development programs are not necessarily a dependable mechanism. Respondents tended to place less value on learning *new classroom teaching strategies* via their industry placements, although participants in multiple years found more long-term effects of this item than did one-time participants (30% versus 17% rated it a "long-term effect"). Respondents were evenly divided (among "no effect," "short-term," and "long-term") on the *classroom content* item. Whether or not the summer experience provides new classroom content depends on the type of job placement and its relevance to the teacher's specific course schedule; this is not a widespread effect of the program.

There were noticeable subject area differences on four of the six items. Science teachers, as compared to mathematics teachers, tended to identify effects (short- or long-term) and to rate the effects more strongly for the following: *professional development*, *professional advancement*, *access to community resources*, and *new classroom teaching strategies*. One possible interpretation is that science teachers found job placements that were more closely aligned with their content specialties.

C. Classroom/School Transfer

Respondents were asked to select from a variety of possible avenues of classroom transfer of the summer experience. These items have appeared on previous internal evaluation surveys and are seen as "desirable outcomes" by the IISME staff. The ranked ordering of the items (by frequency it was chosen) is displayed in Table 9.

Most of the respondents (70%) reported that they *add examples and illustrations* from industry to their classroom instruction. Teachers draw upon examples of the application of concepts, of the ways work is accomplished, of problem-solving and collaboration in the workplace to make their instruction more interesting and relevant for the students. Nearly as many respondents (65%) reported that they provide more *career information* to their students, based on their first-hand experience in the industry setting. Responses to other items were less consistent. About half of the teachers *add new content*, *use more teamwork and group work activities*, and *implement their own or a colleague's "Education Transfer Plan."* Only a third report using more *problem-solving activities* or *connecting students with industry personnel*. Only a very small minority (10%) report any effect on their *classroom management* practices.

Table 9. Classroom Transfer

Increases in Types of Classroom Practice*	Frequency of "Yes"	Percent of "Yes" (n=332)
Add examples & illustrations	234	70.5%
Provide more career information	215	64.8%
Add new content	186	56.0%
Use more team/group work	176	53.0%
Implement Educational Transfer Plan	156	47.0%
Use problem solving	119	35.8%
Connect students with industry	104	31.3%
Improve classroom management strategies	34	10.2%

*More than one category could be selected.

There are some notable group differences among the responses to these items. In particular, there are several differences between responses of teachers who have participated multiple years compared to those who participated only one year. Repeated participation seems to provide teachers with variation in types of experiences, as well as the opportunity to build upon previous experiences and to reflect more upon possible mechanisms of transfer. Items in which the repeat participants scored *higher* (by 10-20 percentage points) include:

- Add new content
- Add examples and illustrations
- Provide more career information
- Use more problem solving
- Use more team/group work
- Connect students with industry

One dramatic group difference was found in the rates of *implementing the Education Transfer Plan (ETP)*. Among those whose last year in the program was prior to 1998, only 27% reported implementing an ETP. However, 65% of those who have participated since 1998 reported implementing their own or one from a colleague. IISME staff have worked to increase the support provided to teachers as they develop an ETP, and thereby increase the relevance and quality of the ETP products, and the teachers appear to have responded positively.

Science teachers tended to select two items at a slightly higher rate than mathematics teachers: *Add new content* (63% of science teachers compared to 55% of mathematics teachers) and *connect students with industry* (37% versus 25%). Mathematics teachers

selected the item *use more problem solving* slightly more than science teachers (39% and 30%, respectively).

D. Leadership Activities

Teachers have reported to IISME staff over the years that the experience encourages them to pursue more ambitious professional goals and leadership activities. These items drew less endorsement from the total group of respondents (see Table 10).

Table 10. Leadership Activities Pursued

Leadership Activity*	Frequency (N=332)	% Reporting Effect
Pursue more professional development	152	45.8%
Mentor other teachers	149	44.9%
Do more professional networking	113	34.0%
Assume new leadership roles	109	32.8%
Initiate new school programs	60	18.1%

*More than one category could be selected.

More recent participants (post-1998) tend to respond more frequently to the items related to creating/seeking out more *professional networking* and *professional development opportunities*, and *initiating school-wide programs*. Examples given of school-wide programs included bringing in new equipment and technologies, grant writing to implement new curriculum or technology programs, initiating new science or technology clubs or elective courses, and procuring speakers and outside resources for special events.

Science teachers reported higher percentages on *do more professional networking* (36% compared to 28% of mathematics teachers) and *pursue more professional development* (50% v. 38%), but there were no subject area differences on any other items in this set.

VI. Benefits of Multiple Fellowships

IISME sponsors have questioned the practice of allowing teachers to participate in the program for multiple years. Experienced Fellows are more likely to be selected by

sponsor employers, but their placement reduces the number of fellowships available for "new" Fellows.

The survey included statements regarding the benefits of multiple years of participation, to be rated by those who have participated more than one year. Slightly over half (55%) of the 424 respondents only participated in the program for one summer. Another 21% have participated two times; 16% were in the program for three to five summers and the remainder (7%) for six to ten summers.

The responses to our questions regarding the benefits of multiple participation are displayed in Table 11.¹¹

Table 11. Rating Benefits of Multiple Fellowships

Statement of Benefits (Positively Worded Statements) *	Frequency of "Agree" or "Strongly Agree"	% Who "Agree" or "Strongly Agree" (N=189)
There are important differences in what I gained each summer.	131	69%
The professional benefits of participating in IISME accumulated with each year of participation.	125	66%
It is important to have this sort of professional development experience more than once for maximum benefit.	119	63%
Statement of Drawbacks (Negatively Worded Statements) ^β	Frequency of "Disagree" or "Strongly Disagree"	% Who "Disagree" or "Strongly Disagree"
I reached a point of diminishing return.	90	48%
Most of my fellowships were quite similar and did not offer new or different benefits.	117	62%

*More than one category could be selected.

Levels of agreement ("strongly agreeing" or "agreeing" to the statement) hovered around two-thirds for the "positively worded" statements. Fellows agreed that there were *important differences in what was gained each year* (69%), that *professional benefits accumulate* (66%), and that it is *important to have this type of professional development*

¹¹ Only those who have participated more than one year responded to these questions; with some missing data, the sample size for this table is 189.

experience more than once for maximum benefit (63%). A similar percentage disagreed that the program did not offer new or different benefits. However, the sample was less consistent on the statement regarding a "point of diminishing return." (48% disagreed or strongly disagreed, but many left the item blank.)

VII. Conclusion and Recommendations

This study was designed to measure the impact of an IISME Summer Fellowship on the teachers who have participated in the program. Specifically, we measured the extent to which IISME Fellows have left the teaching profession, whether the IISME Fellowship experience had any effect on a teacher's career path, and what effect the summer experience had on teachers' professional goals, perspectives, and classroom practice.

The results relating to teacher retention are particularly useful for reassuring sponsors, funders, and school administrators that the program does not entice teachers away from the teaching profession. In fact, IISME Fellows are staying in the field of education at higher rates than their colleagues state- and nationwide. A single program certainly cannot combat the pressures currently facing teachers (e.g., problems within the educational system and the high cost of living in the Bay Area coupled with low teaching salaries), nor address individual teachers' personal and family needs that may force them to leave the profession. But many teachers testified to the positive impact IISME had on their commitment to teaching. And even those IISME Fellows who have left education or who are thinking about leaving report that their experience in IISME encouraged them to stay in the field a bit longer.

In general, survey results present a picture of a program that is highly valued by Fellows and that offers a variety of personal and professional benefits. Fellows may find it enlightening to see which benefits are shared by many of their peers, as well as those that occur thanks to individual effort (or even luck in placements). Sharing these results with other teachers may encourage them to try this new type of experience.

Other study results can be useful to IISME staff in shaping future directions for the Summer Fellowship Program. For example:

1. Science teachers appear to find the fellowship experience more relevant to their classroom content and to their professional development than do teachers of other subjects. How can IISME better shape fellowships that are equally successful with teachers of math and other subjects?
2. Given that 32% of the respondents to this survey say they are thinking of leaving teaching within the next five years, what support mechanisms or incentives can IISME provide to slow down this trend?

3. The attrition trend between 1998-2000 may be an anomaly due to the economic "boom" in the area at that time. Staff should monitor the attrition of Fellows over the next year or two to see if the pattern continues.
4. Approximately one-third of IISME teachers said IISME encouraged them to stay in teaching by offering them a professional support network. What other activities can IISME offer participants to better provide such a collegial network?
5. Most teachers do not view IISME as a mechanism for facilitating their professional advancement along the school career ladder. Is there a way for teachers to receive more recognition and credit by their school or district for completing an IISME Fellowship?
6. Respondents who participated in the Summer Fellowship Program after 1998 reported a much higher rate of implementation of their Education Transfer Plan. This coincides with an increased focus on and support for the ETP by IISME staff and Peer Coaches. What more can IISME do to ensure high quality, well-conceived ETPs or to support their implementation?
7. IISME Fellows do not report much program impact on increasing problem-solving strategies in the classroom or on connecting students with industry resources and personnel. If these are desirable outcomes, IISME should consider mechanisms for providing more direct support for these activities in teachers' Educational Transfer Plans.
8. Fellows seem to endorse the benefits of multiple years of participation but did acknowledge that there is probably a point of diminishing return. IISME may wish to continue to explore this issue in setting policies relating to number of years of eligibility.
9. Since these data show that IISME has little impact in helping teachers with "new classroom teaching strategies," IISME should consider whether this is an important goal for the Fellowship program or whether it outside of our scope.

The vast majority of IISME Fellows ranked the program among the top 10% of their professional development experiences. This is an extremely strong endorsement of the program as it exists. The value of the program is further supported by individual testimonials attached to the program surveys (see one example on page ii). Retention rates are strong, and Fellows see the program as providing important professional and personal benefits. The evaluation has identified some areas for IISME staff consideration, but the overall results point to a strong, viable, and successful program.

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APPENDICES

IISME Teacher Retention and Long-Term Impact Questionnaire
September 2000**Current Employment Status**

1. Are you currently employed in the field of education? Yes No *If yes, answer question 2; If no, answer question 3.*

2. If you ARE currently employed in the field of education:

a. Please check all the positions that you have held in the past 5 years:

Classroom teacher
 Department chair
 School-level administrator
 District staff
 District administrator
 Staff developer

Curriculum specialist
 Computer/technical specialist
 Employed in education-related business--list job title and employer:
 Other: _____

b. Please circle the position(s) listed above that you currently hold.

c. How many years have you been in the field of education? _____ d. What grade level(s) are you currently teaching? _____

e. What subject areas are you currently teaching? _____

f. Do you anticipate leaving the field of education within the next five years? Yes No *If yes, what are the reasons you are considering a career change (check all that apply)?*

Dissatisfaction with job
 Retirement
 To pursue another education-related career
 To pursue a totally different career

Family/personal reasons
 School staffing action
 Other: _____

g. If you checked "Dissatisfaction with job", indicate your reasons by checking any of the following that apply. Please rank order the most important three reasons, with "1"= most important.

Low salary
 Poor administrative support
 Student discipline problems
 Lack of faculty influence and autonomy
 Poor student motivation

No opportunity for professional advancement
 Class sizes too large
 Lack of professional development
 Other: _____

GO DIRECTLY TO QUESTION 4

3. If you are NOT currently in the field of education:

a. What is your current job title and employer? _____

b. How many years were you in the field of education? _____ c. In what year did you leave the field of education? _____

d. What were the reasons for your career change (check all that apply)?

Dissatisfaction with job
 Retirement
 To pursue a totally different career

Family/personal reasons
 School staffing action
 Other: _____

e. If you checked "Dissatisfaction with job", indicate your reasons by checking any of the following that apply. Please rank order the most important three reasons, with "1"= most important.

Low salary
 Poor administrative support
 Student discipline problems
 Lack of faculty influence and autonomy
 Poor student motivation

No opportunity for professional advancement
 Class sizes too large
 Lack of professional development
 Other: _____

4. We want to determine what impact, if any, the IISME experience has on teachers' decisions to stay in teaching or to leave teaching for another career.

a. Did the IISME experience serve as an impetus to stay in teaching (for a while longer or indefinitely): Yes No
If yes, in what way (check all that apply):

Increased my enthusiasm for teaching
 Gave me new perspectives on my role as teacher
 Added income so I could stay in teaching
 Affirmed my commitment to/love for teaching
 Offered me a professional support network

Offered me a professional challenge/chance to learn new things
 Increased my awareness of the benefits of teaching (job security, vacation, retirement benefits, etc.)
 Gave me a breather from teaching to refresh me for the fall
 Other: _____

b. If you have left teaching or are considering leaving teaching, did your IISME experience contribute to your decision to leave?
 Yes No
If yes, in what way (check all that apply):

Gained the confidence to make career change
 Confirmed my desire to work with adults
 Made me feel more respected and valued

Gave me a view of what another work environment is like
 Showed me that other careers offer better pay / working conditions
 Learned skills to make me more employable outside education
 Other: _____

Professional Impact

5. We are interested in the possible effects of participating in the IISME program, both in the short term (immediately after the summer fellowship) and in the long term (in the years following participation). In the following table, we have listed some possible categories of benefits. For each, please check the boxes to indicate if this was a short and/or long term effect for you (check both boxes to indicate both) and, if it was an effect, whether you would rate it as a "weak" "moderate" or "strong" effect. You may also say that there was no effect.

Category	Check one or both on left or check "No Effect"			If an effect, check one		
	Short Term Effect	Long Term Effect	No Effect	Weak Effect	Moderate Effect	Strong Effect
Improved my professional self concept (confidence in abilities, sense of professionalism)						
Increased my commitment to teaching (enthusiasm, importance of role)						
Offered professional development (learning about subject area, reading professional materials in subject area, attending more workshops or courses, learning about technology)						
Facilitated professional advancement (promotions; more credibility among peers and/or administrators; new leadership positions; new curriculum/programs/ resources at school or district level)						
Provided access to and use of community resources (contact with mentor or other industry personnel for own or classroom resources; access to industry or community personnel and resources; connecting students to the community)						
Increased knowledge of careers and career requirements						
Offered new classroom teaching strategies						
Offered new classroom content						

Classroom/School Transfer

6. In what ways (if any) did you draw upon your IISME experience in your classroom planning and instruction (check all that apply):

<input type="checkbox"/> Added new content	<input type="checkbox"/> Implemented my (or colleague's) Action Plan/Education Transfer Plan
<input type="checkbox"/> Added examples and illustrations	<input type="checkbox"/> Connections between students and industry personnel
<input type="checkbox"/> Increased career information	<input type="checkbox"/> Other: _____
<input type="checkbox"/> More emphasis on problem solving	
<input type="checkbox"/> More emphasis on teams and group work	
<input type="checkbox"/> New classroom management techniques	

7. In what ways (if any) did you draw upon your IISME experience in your school setting (check all that apply):

<input type="checkbox"/> Assumed new leadership roles within my department, school, or district	
<input type="checkbox"/> Created/sought more opportunities for professional networking	
<input type="checkbox"/> Created/sought more opportunities for my own professional development	
<input type="checkbox"/> Mentored/coached other teachers	
<input type="checkbox"/> Initiated a school-wide program or change. Describe: _____	
<input type="checkbox"/> Other: _____	

Program Operations and Impact

8. How would you rate the IISME summer fellowship experience compared to all other professional development programs in which you have participated? Best top 10% next 20% next 20% lower 50%

9. Sponsors often ask us if there are benefits to placing teachers in fellowships for multiple years. IF you participated in a summer fellowship more than one summer, please respond to each of the following statements by indicating whether you "strongly agree" "agree" "are not sure" "disagree" or "strongly disagree."

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
There were important differences in what I gained each summer.					
The professional benefits of participating in IISME accumulated with each year of participation.					
I reached a point of diminishing return. (If you agree or strongly agree, please state after how many fellowships this occurred: _____)					
It is important to have this sort of professional development experience more than once for maximum benefit.					
Most of my fellowships were quite similar and did not offer significant new or different benefits.					

10. If you would care to elaborate on the benefits (or lack thereof) of participating multiple summers, we would welcome your comments on a separate sheet of paper.

Appendix II
IISME Data Collection Methodology

Date	Action	Incentive	Follow Up	Result
Sept.	577 surveys sent to home address on file	\$5 gift certificate + \$500 lottery	Re-sent if home address correction received. Re-sent to all other Non-Respondents using school address	326 of 734 total* responded
Sept.	157 surveys sent to school address (when no current home address on file)	\$5 gift certificate + \$500 lottery		
Dec-Jan	Interviewed 6 Fellows from 1999 who left teaching		Phone Interviews	6 responded
Dec-Feb.	100 Non-respondents selected at random from all years. Email and/or phone message to all. Re-sent survey or conducted brief phone interview when contact information was confirmed.		<ul style="list-style-type: none"> • List to cooperating County Offices of Education for district confirmation; • Posted list to IISME's listserv and <i>Eyes on IISME</i> newsletter; • Called last known school/district and tried to track through principal's office, Personnel or colleagues; • Checked school websites, then called teacher at school; • Checked for district against membership roster for California Teachers' Association, then confirmed with district or school; • Internet search for phone numbers/ home addresses/email addresses; • Called Alumni Offices of undergraduate institutions; • Paid Internet service to locate teachers. 	99 of 100 located and responded

*Although 761 individual teachers participated in the IISME Summer Fellowship Program 1985-2000, some were removed from IISME's mailing list at their own request, because they did not complete their fellowship or they are deceased.

About Industry Initiatives for Science and Math Education (IISME)

IISME is an education nonprofit established in 1985 by a group of 13 Silicon Valley companies and the Lawrence Hall of Science at UC Berkeley. IISME's mission is to transform teaching and learning through industry-education partnerships. Through these partnerships IISME provides teachers with experiences and tools they need to adapt practices and change schools so that all students are prepared to be lifelong learners, responsible citizens, and productive employees. IISME's founders decided to focus on teachers as the primary agents for, and most important resource in, effecting meaningful change in mathematics and science education.

IISME's flagship program, the **Summer Fellowship Program**, has offered over 1,400 eight-week paid internships to Bay Area K-14 teachers. IISME provides training and support to its IISME Teacher Fellows throughout the year, ensuring effective classroom transfer of the summer experience back to the Fellows' students. IISME also sponsors **Future Connections**, which coordinates industry-based professional development days for educators to a wide variety of companies in the greater San Francisco Bay Area. Future Connections was started in May 1996 and since then over 1,800 educators in grades K-16 have been served. In 2000-01 IISME also launched **Future Connections for Youth**, providing one-day industry visits for students and their teachers, tailored to the teachers' specific curricular goals and focused on students in educationally disadvantaged high schools. During the pilot phase, IISME conducted seven industry field trips, serving a total of 144 students and their teachers.

For more information about IISME, visit <http://iisme.org> or send an email to iisme@iisme.org.

About the Authors

Dr. Kathryn Sloane Weisbaum earned her doctorate in educational research and evaluation from the University of Chicago and was subsequently awarded a National Academy of Education Spencer Postdoctoral Fellowship. She has served on the educational research faculties at the University of California at Berkeley and the University of Illinois at Urbana-Champaign. She has conducted program evaluations for teacher enhancement and curriculum development projects, primarily in the area of math and science education, for over 15 years. She is a consultant for the National Science Foundation multi-site evaluation of Scientific Work Experience Programs for Teachers (SWEPTs) and co-authored the paper, *Evaluation of Scientific Work Experience Programs for Teachers: Current Practice and Future Directions* that provided a foundation for the multi-site evaluation.

Danny Huang, a doctoral candidate at University of California, Berkeley, provided the statistical analysis and research support for this study. Mr. Huang will receive his Ph.D. in Education in May 2002, specializing in Policy, Organization, Measurement and Evaluation. Mr. Huang has worked on a variety of relevant projects, most recently at Policy Analysis for California Education (PACE), where he provided statistical and research support for a study measuring the retention of early childhood teachers and the impact of training and stipends on their performance. Mr. Huang holds a B.A. in Psychology from University of Southern California, an M.S. in Industrial/Organizational Psychology from California State University, San Bernardino, and an M.A. in Education from Berkeley.



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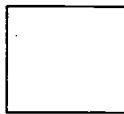


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